THE PREDATORY STATUS OF *CONOCEPHALUS LONGIPENNIS* (ORTHOPTERA: TETTIGONIIDAE) IN RICE FIELDS OF WEST MALAYSIA[1]

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ABSTRACT: *Conocephalus longipennis* is widespread and common in rice fields. After the rice flowers, this grasshopper feeds on flowers and later on young grains, but early in the growing cycle it is an active biological control agent. *C. longipennis* was the only arthropod predator in West Malaysia observed to destroy egg masses of *Scirpophaga incertulas* (Pyralidae) and *Leptocorisa oratorius* (Coriscidae), both important rice pests in Southeast Asia. Field density was estimated at about 20,000 per hectare.

Conocephalus longipennis (Dehaan) is widespread throughout southeast Asia, and was found during the present study to be the most common orthopteron in West Malaysian rice fields. Early in the growing season the species is a general predator, but as the plants mature, feeding takes place on flowers and young grains (Rothschild, 1971). While being a general predator the present study suggests that *C. longipennis* fills a unique niche as a predator on egg masses of various insects; most importantly *Scirophaga incertulas* (Walker) (Lepidoptera) and *Leptocoriza oratorius* (F.) (Hemiptera). Both insects are important rice pests over large regions of southeast Asia, [Kamran and Raros, (1969) and Rothschild (1970)]. The ability to destroy egg masses of moths which cover their eggs with protective hairs, and also break open relatively large, hard surface eggs such as Hemiptera egg masses, suggests that *C. longipennis* and related species are important predators in a variety of crops which they inhabit. They also may help control pest populations during the off-season and in the margins of rice fields.

MATERIALS AND METHODS

C. longipennis nymphs and adults were collected in rice fields throughout West Malaysia, but most of the research was conducted at the Malaysian Rice Research Station at Bumbong Lima in the state of Province Wellesley.

Density was monitored by means of weekly samples taken over a two year period from a one hectare area that was untreated with any pesticide. One hundred randomly selected rice hills were sampled each week by visual searching during both wet and dry seasons. Specimens collected were

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placed in vials of alcohol.

In order to establish that *C. longipennis* would feed on leafhoppers and to develop an understanding of feeding on the various instars and relative numbers eaten per day, feeding evaluations on the leafhopper, *Nephotettix virescens* (Distant), (Homoptera: Cicadellidae) were made in glass tubes 22 cm high and 3 cm diameter. The bottom 2 cm of the tube was placed in a plastic vial 7.5 cm high and 3.3 cm in diameter. The plastic vial was filled one-third with tap water. A fresh rice tiller was placed in the plastic vial and held in place by a 5 mm thick layer of wax that was poured when hot on the water surface. After the wax had cooled and hardened, a thin layer of additional liquid was added to the vial. The glass tube was placed over the rice tiller, set on the waxed surface, and became fixed firmly in place as the wax hardened. One predator and ten leafhoppers were placed in each tube which was then covered with a cloth screen secured by a rubber band.

Tubes were checked daily to determine the number of live leafhoppers and predators. If a predator died, it was replaced by a live one collected in the field. Leafhoppers were obtained from rearing cages. Leafhopper mortality was recorded for 3 days.

Evaluations of grasshopper feeding on leaves and young grains were conducted in cages with potted plants. One grasshopper was placed in each cage with a potted rice plant. Visual observations were made of feeding, growth and longevity.

Observations of field predation and behavior were made by watching specimens in untreated areas for extended periods of time at different parts of the day ranging from just before daylight until shortly after dark.

RESULTS AND DISCUSSION

Based on previous studies (Rothschild, 1970 and Rothschild, 1971), plus observation during the present study, the feeding of *C. longipennis* may be described as opportunistic. Nymphs and adults eat a mixture of plant material, decaying matter and living arthropods. Observations in West Malaysia would suggest the primary contribution to pest control is made at night when they move over the plant surface feeding on a variety of insects such as aphids, leafhoppers, and eggs of various arthropods. Since they are relatively large insects with strong mandibles, they can destroy hard-shelled eggs or break through the hard covering of egg masses.

During field collections partly eaten egg masses of *Scirpophaga incertulas* were seen in the field. Visual observations in the field showed that *C. longipennis* was eating the egg masses of both *S. incertulas* and *L. oratorius.* Frequently *C. longipennis* would destroy all the eggs in the mass, but in breaking open the egg mass other insects could feed on the remaining eggs. The larvae of *Exochomus nigromaculatus* Goose (Coleoptera:

Coccinellidae) and adults of *Apalochrus rufofasciatus* Pic. (Coleoptera: Melyridae) and *Paederus fuscipes* Curt. (Coleoptera: Straphylinidae) were observed in the field feeding on eggs of *S. incertulas* in egg masses which had been opened.

Laboratory feeding evaluations suggested that adults and nymphs of *C. longipennis* would feed on a variety of arthropods. When *C. longipennis* were caged for 3 days with ten *N. virescens* nymphs, all instars were consumed equally. In 3 days 65 percent of second-instar nymphs were eaten compared with 62 percent of third-instar nymphs and 65 percent of fourth-instar leafhopper nymphs. Since grasshoppers were caged with only one size nymph at a time, preference was not determined, but all sizes of leafhoppers were acceptable as food.

Laboratory evaluations indicated *C. longipennis* does not readily feed on the leaves of rice plants. When forced to feed on leaves alone nymphs did

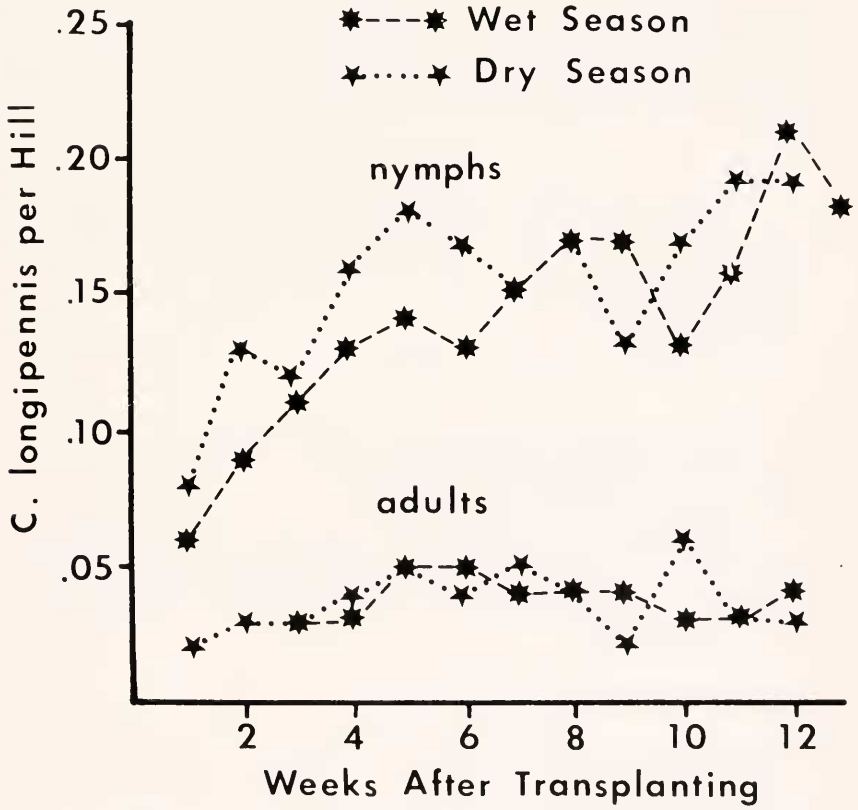

Fig. 1: Density of *C. longipennis* nymphs and adults in an untreated rice field at Bumbong Lima, West Malaysia. Average of two years.

not complete their development. When nymphs fed on developing seeds from flowering until near harvest, they appeared to develop normally.

Populations of *C. longipennis* were observed to invade rice fields shortly after transplanting by flying and walking from nearby areas. Adult density was relatively stable throughout the crop period (figure 1), and was about the same during both wet and dry seasons during the two years studied. Nymphs are more abundant than adults (figure 1). Nymph density increased during the first half of the growing season, and then remained rather stable until harvest. Adults plus nymphs may reach levels of over 0.14 specimens per plant (figure 1). This represents a population of over 20,000 per hectare.

C. longipennis is one of the largest and most abundant arthropods seen in rice fields, and so it represents a major component of the arthropod biomass. Since this species is primarily a predator during most of the rice growing season, its food requirements represent a significant part of the predator intake of the community. Its role is further enhanced because it fills a unique niche unfilled by other arthropods in the environment. Considering mobility, population density, and feeding behavior, it would seem that *C. longipennis* may make an important contribution to pest control in rice fields during the first half of the growing season.

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